REMARKS

Claims 1-29 are pending in this application. An amendment is proposed cancelling withdrawn claims 11-26 without prejudice or disclaimer herein. Upon entry of this amendment, claims 1-10 and 27-29 will be pending.

Claims 1, 2, 7, 9-10 and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kono et al. (U.S. Patent No. 4,588,633). Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kono et al. (U.S. Patent No. 4,588,633) either individually or in view of Takita et al. (U.S. Patent No. 5,051,183). Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kono et al. (U.S. Patent No. 4,588,633) in view of Takita et al. (U.S. Patent No. 5,922,492) (Office action point 2).

Reconsideration of these rejections is respectfully requested in view of the following remarks.

At page 2, lines 5 to 3 from the bottom, of the final Office Action, the Examiner states that "thermal setting" is a conventional and well known step in the microporous membrane manufacturing process.

However, in order to produce the microporous polyolefin membrane of the present invention, which has excellent properties, not only is the thermal setting necessary but also it is extremely important to **timely** conduct the thermal setting.

In order to demonstrate this, Applicants have conducted experiments to show the importance of the timely thermal setting in the production of the microporous polyolefin membrane of the present invention. The methods and results are described in the first attached Declaration under 37 CFR 1.132, labeled "Exhibit A".

From the results of the experiment in this Declaration, it can be fairly concluded:

1) that the properties (especially the air permeability) of the microporous polyolefin membrane obtained by the method in which the thermal setting is not conducted or is conducted after the solvent washing were disadvantageously poor, as compared to those obtained by the method in which the thermal setting is conducted before the solvent washing; and

2) that therefore, in order to produce the microporous polyolefin membrane of the present invention, which has excellent air permeability, not only is the thermal setting necessary but also it is extremely important to timely conduct the thermal setting.

Applicants further note that the effect to the timely thermal setting is not recognized in each of U.S. Patent Nos. 4,588,633 (Kono et al.), 5,051,183 (Takita et al. '183) and 5,922,492 (Takita et al. '492). Therefore, this effect is **unexpected** based on these references.

Applicants further note that claim 1 recites a specific limitation on the angle at which the crystal lamellas are inclined to the plane constituting the membrane. The Examiner had stated in the Office action of November 26, 2002, with regard to Kono et al., that "the Examiner takes Official Notice that the orientation of the lamella crystals and membrane orientation function are either inherent physical properties of the membrane made by the gel sheet process, or obvious

optimizations ..." The Examiner has ~~not~~ repeated this argument in the final Office action, but ? Applicants note that unless this limitation of claim 1 is either taught, suggested or motivated by the references, claim 1 must be non-obvious the references.

Applicants have conducted experiments with regard the effect of the timely thermal setting on the directivity of the lamellas. The methods and results are described in second attached Declaration, labeled Exhibit B.

From the results of the experiments in this declaration, it can be fairly concluded that in Takita et al. '183, the directivity (%) of lamellas to the direction perpendicular to the membrane is **lower than 40%**. That is, the limitation of claim 1 on the angle of the lamellas is not inherent in Takita '183. Similarly, there is no basis for concluding that this limitation would be inherent in Kono et al.

These results further argue against any suggestion or motivation in Takita et al. for the timely thermal setting step resulting in the present invention as recited in claim 1.

It should be noted that in each of Kono et al. and Takita et al. '492, the production of a microporous membrane is conducted in substantially the same manner as in Takita et al. '183, in which a mixture of a liquid paraffin, a polyethylene and an antioxidant is prepared; the resultant mixture is formed into a sheet; the resultant sheet is subjected to biaxial stretching to thereby obtain a membrane; and the resultant membrane is washed with an organic solvent to remove the liquid paraffin to thereby obtain a microporous membrane.

Further, as mentioned in the response to the previous Office Action, in each of Kono et al.

and Takita et al. '492, there is no description with respect to the thermal setting.

Therefore, also in each of Kono et al. and Takita et al. '492, the directivity (%) of lamellas to the direction perpendicular to the membrane is not necessarily at least 40%, and the effect of the timely thermal setting is **not** recognized.

As apparent from the above, even though the "thermal setting" itself is a conventional and well known step, the timing of the thermal setting required for producing a microporous membrane with excellent properties is not known to the public or described in Kono et al. '633, Takita et al. '183 or Takita et al. '492. Therefore, the importance of the **timely** thermal setting is not obvious to a person skilled in the art from the references cited in any combination.

Further, at page 2, third line from the bottom, to page 3, line 4, of the Office Action, the Examiner states as follows:

> "Note also evidence that the air permeability in Table A of Takita (U.S. 5051183) is in the range of 30 - 148 sec/100 cc, i.e., which has comparable or greater air permeability than the Applicants' membranes illustrated in Table A (Response, page 6). Additionally, it is noted that Takita's membrane pore diameter is in the range of 0.02 - 0.05 μm (Table 1, column 10), whereas the mean pore diameter of Kono's membrane is in the range of 0.1 - 4 μm, as such it is believed that Kono's membrane would inherently have comparable or greater air permeability as well."

However, it is basic knowledge of a person skilled in the art that usually, the air permeability of a porous article is substantially **independent of the pore diameter** of the porous article.

It is apparent that the air permeability of a porous article depends on the **shape of the void** of the porous article, and that if the void has a linear shape and the diameter is uniform in the void,

the air permeability depends on the pore diameter (in other words, the diameter of the void).

However, in many cases, the void of the porous article has a bent or winding shape in which the diameter of the void is not uniform. In such a case, the air permeability may depend on the properties of the void shape other than the diameter, such as the degree of bending and the uniformity of the diameter in a void. In other words, **usually, the air permeability of a porous article is independent of the pore diameter of the porous article**.

For this reason, it is impossible to estimate the air permeability of one porous article based on the air permeability and pore diameter of another porous article, unless the void shape of one porous article is the smaller figure of the void shape of another porous article.

It is not conceivable that the void shape in Kono et al. has the same void shape as in Takita et al. Therefore, it is impossible to estimate the air permeability of the microporous membrane of Kono et al. based on the air permeability and pore diameter of the microporous membrane of Takita et al.

As apparent from the above, it is impossible even for a person skilled in the art to obtain the microporous polyloefin membrane of the present invention based on the disclosure of Kono et al. and Takita et al.

Applicants therefore assert that claims 1-10 and 27-29 are novel and non-obvious over Kono et al. '633, Takita et al. '183 and Takita et al. '492, taken separately or in combination. Reconsideration of the rejection is respectfully requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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PATENT TRADEMARK OFFICE

Enclosures: Declarations under 37 C.F.R. 1.132 (2 - Exhibit A and Exhibit B)
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of: **Hidehiko FUNAOKA et al.**

Serial No.: **09/806,309** | Group Art Unit: **1771**

Filed: **July 6, 2001** | Examiner: **Victor S. Chang**

P.T.O. Confirmation No.: 6699

For: **MICROPOROUS POLYOLEFIN MEMBRANE, AND METHOD OF PRODUCING THE SAME**

DECLARATION UNDER 37 C.F.R. §1.132

Commissioner for Patents
Washington, D.C. 20231

Sir:

I, Kotaro Takita, hereby declare:

1) That I am one of the inventors of the instant invention, and

2) That the experiments given below were carried out under my general direction and supervision.

I, the undersigned, declare that all statements made herein of my own knowledge are true and that all statements made of information and belief are believed to be true; and further that these statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: Mar. 19, 2003

Name and Title of Person Signing: Kotaro Takita, Researcher

Signature: Kotaro Takita

Exhibit A

Experiments to show the importance of the timely thermal setting in the production of the microporous polyolefin membrane of the present invention

1. Object of the Experiments

The object of the experiments is to show that in order to produce the microporous polyolefin membrane of the present invention, which has excellent air permeability, it is extremely important to timely conduct thermal setting.

2. Method and materials

COMPARATIVE EXAMPLE 4

Substantially the same procedure as in COMPARATIVE EXAMPLE 1 of the present application (see page 19, lines 11 to 14 of the present specification) was repeated, to thereby obtain a microporous membrane.

The obtained microporous membrane was thermally set at 122 °C for 10 seconds, to thereby obtain a thermally-set microporous membrane.

Evaluation of the obtained thermally-set microporous membrane was conducted in the same manner as in that described at page 17, line 11 to page 18, line 11 of the present specification.

3. Results

The properties of the obtained thermally-set microporous membrane are shown in Table A below, together with those of the microporous membranes obtained in EXAMPLE 1 and COMPARATIVE EXAMPLE 1 of the present application.

Table A

	Example 1	Comparative Example 1	Comparative Example 4
Film forming conditions			
Stretching conditions			
Stretching ratio	5×5	5×5	5×5
Temperature (°C)	115	115	115
Th rmal setting			
Conducted / not conducted	conducted (before solvent washing)	not conducted	conducted (after solvent washing)
Temperature (°C)	122	–	122
Time (seconds)	10	–	10
Properties of microporous membranes			
Thickness (µm)	25	25	25
Air permeability (sec/100cc)	165	650	650
Porosity (%)	60	40	38
Tensile strength (kgf/cm^2):TD	800	805	1200
Average pore size (µm)	0.38	0.03	0.08
Directivity of lamellas to the direction perpendicular to the membrane (%)			
Section in the MD	92	38	39
Section in the direction perpendicular to the MD and in the thickness direction	90	32	35
X-ray analysis results a	0.53	0.40	0.42
r (TD)	1.54	0.85	1.06
r (MD)	4.2	3.0	3.5
Thermal shrinkage (%)MD/TD	6.6/5.0	10.2/7.1	7.0/6.0

4. Observation

As apparent from item 2 above, the thermally-set microporous membrane of COMPARATIVE EXAMPLE 4 was obtained in substantially the same manner as in EXAMPLE 1 of the present application, except that the thermal setting was conducted after the methylene chloride washing.

On the other hand, in EXAMPLE 1, the thermal setting was conducted before the methylene chloride washing, and in COMPARATIVE EXAMPLE 1, the thermal setting was not conducted.

As apparent from Table A above, in COMPARATIVE EXAMPLE 4, the average pore size was 0.03 μm, whereas in EXAMPLE 1, the average pore sizes were 0.38 μm.

The directivity of lamellas to the direction perpendicular to the membrane in COMPARATIVE EXAMPLE 4 was lower than that in EXAMPLE 1.

Further, in COMPARATIVE EXAMPLE 4, the air permeability was 650, whereas in EXAMPLE 1, the air permeabilities were 165.

These properties of the membrane obtained in COMPARATIVE EXAMPLE 4 are almost the same as those of the membrane obtained in COMPARATIVE EXAMPLE 1.

These results clearly show that the properties (especially the air permeability) of the microporous polyolefin membrane obtained by the method in which the thermal setting is not conducted or conducted after the solvent washing were disadvantageously poor, as compared to those obtained by the method in which the thermal setting is conducted before the solvent washing, and that in order to produce the microporous polyolefin membrane of the present invention, which has excellent air permeability, not only is the thermal setting necessary but also it is extremely important to timely conduct the thermal setting.

5. Conclusion

As apparent from the above, the properties (especially the air permeability) of the microporous polyolefin membrane obtained by the method in which the thermal setting is not conducted or conducted after the solvent washing were disadvantageously poor, as compared to those obtained by the method in which the thermal setting is conducted before the solvent washing.

Therefore, in order to produce the microporous polyolefin membrane of the present invention, which has excellent air permeability, not only is the thermal setting necessary but also it is extremely important to timely conduct the thermal setting.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of: Hidehiko FUNAOKA et al.

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Filed: July 6, 2001 | Examiner: Victor S. Chang

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Sir:

I, Kotaro Takita, hereby declare:

1) That I am one of the inventors of the instant invention, and

2) That the experiments given below were carried out under my general direction and supervision.

I, the undersigned, declare that all statements made herein of my own knowledge are true and that all statements made of information and belief are believed to be true; and further that these statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: Mar. 19, 2003

Name and Title of Person Signing: Kotaro Takita, Researcher

Signature: KoTaro Takita

Exhibit B

Experiments to show that the effect of the timely thermal setting is not recognized in U.S. Patent No. 5,051,183

1. Object of the Experiments

The object of the experiments is to show that the effect of the timely thermal setting is not recognized in U.S. Patent No. 5,051,183 (Takita '183).

2. Method and materials

COMPARATIVE EXAMPLES 5 to 9

Examples 1 to 5 of Takita '183 were reworked, and the properties of the obtained microporous membranes were compared with those of the microporous membrane obtained in Example 1 of the present application.

Evaluation of the obtained microporous membrane was conducted in the same manner as in that described at page 17, line 11 to page 18, line 11 of the present specification.

3. Results

The properties of the obtained microporous membrane are shown in Table B below. together with those of the microporous membrane obtained in EXAMPLE 1 of the present application.

Table B

	Ex. 1	Com. Ex. 5	Com. Ex. 6	Com. Ex. 7	Com. Ex. 8	Com. Ex. 9
Film forming conditions						
Stretching conditions						
Stretching ratio	5×5	7×7	7×7	7×7	7×7	7×7
Temperature (°C)	115	115	115	115	115	115
Thermal setting						
Temperature (°C)	122	–	–	–	–	–
Time (seconds)	10	–	–	–	–	–
Properties of microporous membranes						
Thickness (μm)	25	4	5	4	16	12
Air permeability (sec/100 cc)	165	148	37	30	55	112
Average pore size (μm)	0.38	0.02	0.03	0.04	0.05	0.04
Directivity of lamellas to the direction perpendicular to the membrane (%)						
Section in the MD	92	36	38	38	38	39
Section in the direction perpendicular to the MD and in the thickness direction	90	30	32	34	35	37
X-ray analysis results a	0.53	0.37	0.40	0.43	0.43	0.44
r (TD)	1.54	0.75	0.85	1.00	1.10	1.20
r (MD)	4.2	2.5	3.0	3.1	3.1	8.2

4. Observation

As apparent from Table B above, in each of COMPARATIVE EXAMPLES 5 to 9, the directivity (%) of lamellas to the direction perpendicular to the membrane is lower than 40 %.

According to the description at page 9, line 22 to page 10, line 6 of the present specification, when the directivity of lamellas is lower than 40 %, the membrane suffers problems due to anisotropy and/or low permeability. Therefore, the membrane of Takita '183 may have at least one of these problems. In fact, the air permeability of the membrane of each COMPARATIVE EXAMPLE (except for COMPARATIVE EXAMPLE 8) is disadvantageously low.

It is apparent that, although not clearly described in Takita '183, the solution of these problems is generally important in the field of the microporous membrane for the use described in the present specification. Therefore, in the course to the completion of the invention of Takita '183, much effort should have been made toward the solution of these problems.

If the effect of the timely thermal setting (which is effective for the solution of these problems) is recognized in such effort, the directivity of lamellas in Takita '183 might be 40 % or more. That is, the effect of the timely thermal setting is not recognized in Takita '183.

5. Conclusion

As apparent from the above, in Takita '183, the directivity (%) of lamellas to the direction perpendicular to the membrane is lower than 40 %.

If it is recognized in Takita '183 that the timely thermal setting is effective for producing a microporous membrane having excellent properties, the directivity of lamellas in Takita '183 must be 40 % or more.

Therefore, the effect of the timely thermal setting is not recognized in Takita '183.